Environmentally friendly chromium plating system

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INTRODUCTION

Chromium plating is an indisputable "design classic" that is not easily replaced. Unfortunately the conventional plating process is based on hexavalent chromium, Cr(VI), which is both carcinogenic and mutagenic. To prevent toxic mist formation in production, persistent and bio-accumulative PFOS are used. Cr(VI) will be banned from production by 2017. Furthermore, chromium is always plated on top of a nickel coating system, which acts as a sacrificial anode. This provides corrosion resistance, but can cause nickel dermatitis.

Figure 1: Examples of the widespread use of chromium plating, often for decorative use.

THEORY

This project presents a coating system comprising a non-toxic trivalent chromium, Cr(III), layer on top of an extremely corrosion resistant tin-nickel alloy coating with negligible nickel release. Between the coating and the substrate material (brass, steel, aluminium, plastics, etc.), a copper layer is deposited. Compared to present coatings, this system provides:

- Elimination of Cr(VI) in production
- No need for toxic mist suppressants (PFOS) and extensive precaution systems
- No risk of nickel dermatitis from surface/skin contact
- Reduced layer thickness → reduced material consumption and processing time
- Reduced energy consumption in production
- Improved corrosion resistance

The coating is a greener, healthier and cheaper coating than the present alternative. Given the extensive use of chrome plating worldwide today, the positive effects are considerable.

METHODS

The strengths of the developed coating have been documented to convince chromium platers, especially in the automotive industry. In this process, patents and scientific articles on the corrosion properties of the coating have been written and visits to sub-suppliers of parts to the automotive industry in Germany and USA has been a natural part of the work carried out in the last months.

CONCLUSION

A new green and healthy chromium coating system, which eliminates carcinogenic, mutagenic, persistent and bio-accumulative substances in the production, and potential dermatitis development from prolonged surface/skin contact, has been developed.